



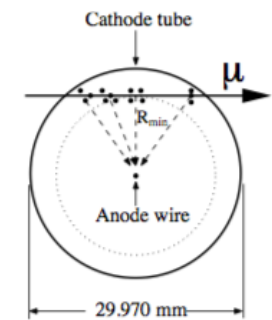
sMDT WBS 6.6.Y.5

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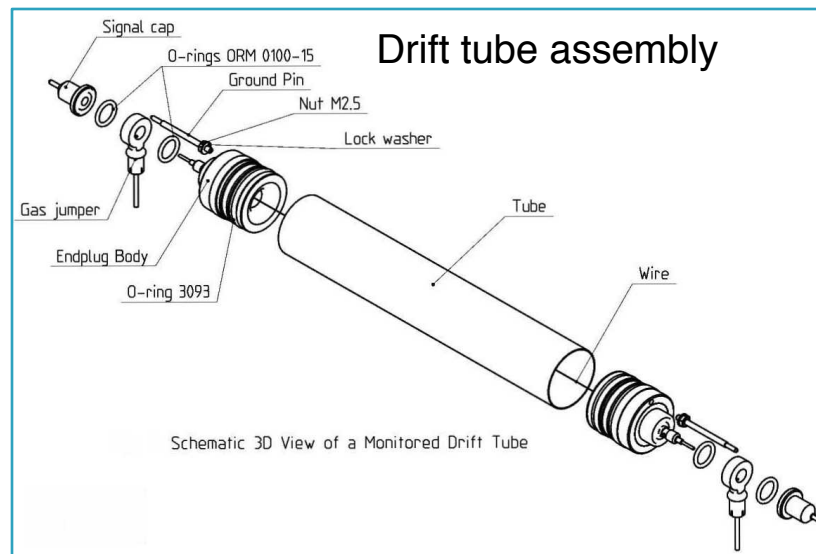
U.S. ATLAS HL-LHC Scrubbing Meeting
Berkeley National Laboratory
August 22, 2016

Overview

- ✓ Small Muon Drift Tube (sMDT) chambers
- ✓ 24,000 sMDT tubes constructed at MSU
- ✓ 48 sMDT chambers constructed at University of Michigan
- ✓ Pre-construction starts in FY17-FY18
 - Set up cleanroom at MSU (FY18)
 - Set up cleanroom and first set of assembly structure at Umich (FY17)
 - Produce tubes and chamber for module 0



Drift tube
cross-section





Major accomplishments in FY16

- ✓ Major effort to establish the cost estimation and produce p6 (task list) for sMDT project
- ✓ Included the sMDT R&D (pre-construction) into next 5 years NSF proposal
- ✓ RBT for building 2 small MDT chambers for Phase II electronics development tests (at Arizona and UIUC) – support one month salary for a Mech. Engineer at the Univ. of Michigan (\$10.1k)
- ✓ Re-set up the tube and chamber assembly facilities for standard drift tubes (3 cm in diameter)
- ✓ Constructed and tested (tension, leak, HV, dark current), 250 tubes
- ✓ Already glued 12 tube layers (each layer 16 tubes) with precision jiggling on a granite table – chamber construction will be done by Aug. 20, and chamber tests (HV, leak, dark current) should be done by Sept. 30, 2016



FY16 Budget (including RBTs)

- ✓ RBT for building 2 small MDT chambers for Phase II electronics tests (one month salary support for a mech. Engineer)

	FY16	
	FTE %	\$ / hr
M. Engineer	0.08	\$71.00
M. Technician		
Elec. Technician		
Elec. Student		
Total Personnel Cost		\$10.1
Prototypes/Materials		0
Travel		0
Others		0
Total Cost (k\$)		10.1



Plans & Milestones for FY17

- ✓ **As proposed in NSF proposal (from 2017 – 2022)**
 - **Univ. of Michigan plans to re-set up the chamber assembly clean room with temperature and humidity control system in 2017**
 - **UM also plan to purchase / set up the first set of sMDT chamber assemble jigging and make precision measurement and checks on the chamber assembly granite table**
- **Mech. Engineer (2 month) and Technician (2 month) support is required (\$35k)**
- **Equipment and materials: 40k**
- **One travel to MPI by engineer: \$3k**
- **Total request in 2017 is \$78k**
- **Tasks:**
 - ❖ **Set up the chamber clean room: July 15, 2017**
 - ❖ **Set up the assembly jigging (the first set): Sept. 30, 2017**



sMDT R&D Budget Request for FY17

- ✓ Total 4 month support for Mech. Engineer (2 month) and technician (2 month) to set up chamber clean room and 1st jigging

	FY17	
	FTE %	\$ / hr
Mech. Engineer	0.16	\$71.68
Mech. Technician	0.16	\$57.80
Elec. Technician		
Elec. Student		
Total Personnel Cost		\$35.0
Prototypes/Materials		\$40.0
Travel		\$3.0
Others		0
Total Cost (k\$)		78.0



Plans & Milestones for FY18-FY20

✓ 6.6.5.5, sMDT tubes

- Set up cleanroom at MSU
- Set up tube construction and testing stations
- Produce tubes for module 0

✓ 6.6.3.5, sMDT chambers

- Design, assemble and test the automatic gluing machine
- Set up the chamber spacer assembly station
- Set up chamber construction (with two sets of assembly jigging)
- Design and build the chamber testing stations (HV, leak, dark current and FE electronics for readout)
- Produce chamber module 0



Updated sMDT tube budget for FY18-FY20

✓ 6.6.5.5, sMDT tubes budget updates needed

- NSF budget was missing overhead and benefits
- Typo in spreadsheet
- Total labor cost \$180k → \$320k

✓ Updated estimate for FTE and material to set up clean room and sMDT tube stations

- Start in FY18
- ME: 0.75 FTE → 1.0 FTE
 - ❖ 0.25 FTE in 2018 for room and table setup
- EE: 0.5 FTE → 0 FTE
 - ❖ Use same tooling as before
- Mech Tech: 0.75 FTE → 1.25 FTE
 - ❖ 0.25 FTE in 2018 for room and table setup
- Total labor cost \$320k → \$331k
- Total material: \$120k → \$140k
 - ❖ Additional \$20k for simple clean room enclosure – existing space not adequate
 - ❖ Shift \$15k from FY19 to FY18 for tube testing and setup purchases



Funding Request for FY18-FY20

✓ 6.6.5.5, sMDT tube assembly facilities

		FY18		FY19		FY20	
		FTE %	\$ / hr	FTE %	\$ / hr	FTE %	\$ / hr
Personnel Effort and \$/hr	Mech Engineer	0.25	\$100.00	0.5	\$103.00	0.25	\$106.09
	Elec Engineer						
	Mech Technician	0.5	\$63.08	0.5	\$66.92	0.25	\$68.93
Costs k\$	Total Personnel Cost	\$102.093		\$150.886		\$77.707	
	Prototypes/Materials	35		45		60	
	Travel	0		3		0	
	Others	0		0		0	
	Total Cost (k\$)	122.093		\$213.886		\$137.707	



Updated sMDT chamber budget for FY17-FY20

✓ 6.6.3.5, sMDT chamber budget updates



Funding Request for FY17-FY20

✓ 6.6.3.5 sMDT chamber assembly facilities

		FY16		FY17		FY18		FY19		FY20	
		FTE %	\$ / hr	FTE %	\$ / hr	FTE %	\$ / hr	FTE %	\$ / hr	FTE %	\$ / hr
Personnel Effort and \$/hr	Mech Engineer	0.08	\$71.00	0.16	\$71.68	0.5	\$72.68	1	\$73.83	0.10	\$76.04
	Elec Engineer							0.25	\$69.50	0.25	\$71.55
	Mech Technician	0	0	0.16	\$57.80	0.25	\$58.80	1	\$59.54	0.1	\$61.33
	Eng Student									0.1	\$30.66
Costs k\$	Total Personnel Cost	0		35		\$90.647		\$267.723		\$61.610	
	Prototypes/Materials	0		40		105		100		20	
	Travel	0		3		0		0		0	
	Others	0		0		0		0		0	
	Total Cost (k\$)	\$10.1 (RBT)		\$78		\$195.647		\$367.723		\$81.610	



Summary/Remarks

- ✓ Muon sMDT chamber pre-construction will start in FY17.
 - Room and table setup at University of Michigan in 2017
 - Room and table setup at Michigan State University in 2018
- ✓ FTE and cost slightly higher than previously estimated
 - Bug-fix in labor estimate for MSU
 - Additional FTE to set up room and table at MSU in 2018
- ✓ Total cost estimate increased by \$150k
- ✓ Construction budget unchanged

BACKUP



R&D Budget FY18-FY20 (original)

	FY18		FY19		FY20	
	FTE %	\$ / hr	FTE %	\$ / hr	FTE %	\$ / hr
Sr. Engineer	0.1	\$100.00	0.2	\$100.00	0.05	\$100.00
Jr. Engineer	0.1	\$100.00	0.2	\$100.00	0.05	\$100.00
Elec. Technician	0	\$50.00	0	\$50.00	0	\$50.00
Elec. Student	1	\$25.00	1	\$25.00	0.05	\$25.00
Total Personnel Cost	\$79.92		\$115.44		\$19.98	
Prototypes/Materials	5		5		5	
Travel	10		10		10	
Others	0		0		0	
Total Cost (k\$)	225.36		130.44		34.98	



Funding Request for FY17

		FY17	
		FTE %	\$ / hr
Personnel Effort and \$/hr	Sr. Engineer	0.1	\$100.00
	Jr. Engineer	0.1	\$100.00
	Elec. Technician	0	\$50.00
	Elec. Student	1	\$25.00
Costs k\$	Total Personnel Cost	\$79.92	
	Prototypes/Materials	5	
	Travel	10	
	Others	0	
	Total Cost (k\$)	94.92	



Justifications for FY17 Budget Request